

Thermal Stir Welding of High Strength and High Temperature Alloys for Aerospace Applications, Phase II

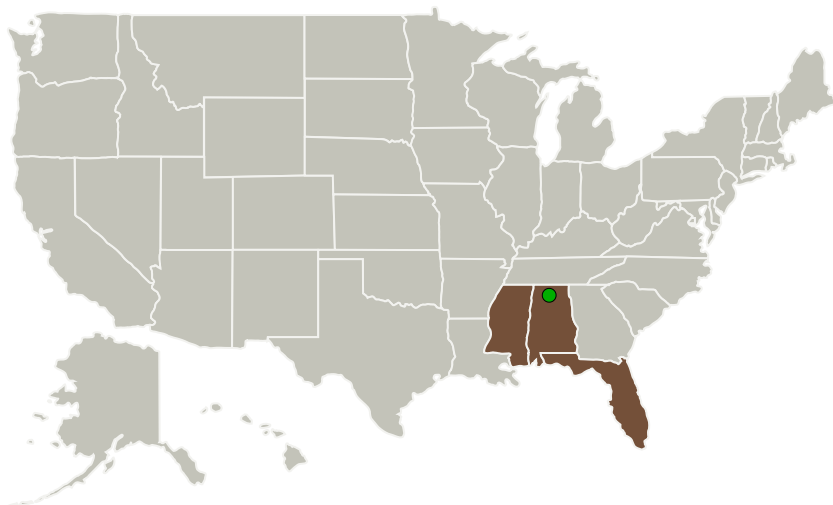
Completed Technology Project (2010 - 2013)



Project Introduction

The Keystone and MSU team propose to build on the successful feasibility demonstration conducted during Phase I to complete the development of solid-state joining of high strength and temperature alloys utilizing the Thermal Stir Welding process. The focus alloy for this project is Haynes 230; the alloy of choice typically utilized in rocket engine nozzle skirts. This class of alloy is difficult to fusion weld and with the successful Phase I demonstration has now been shown weldable using solid-state methods. Therefore, the Keystone team is proposing to utilize a Thermal Stir Welding process; a solid-state welding process that decouples the stirring and heating features of the process to enable optimization of each key process parameter. By independently controlling and optimizing these process parameters, the best metal working parameters can be established and utilized to plasticize and stir the Haynes 230 alloy. Achievement of this objective will enable superior mechanical properties in the weld joint and thus maximize the capability of the weld for the intended application. During Phase II the Keystone team will complete process development and demonstrate TRL-4 readiness by producing a 24" diameter subscale nozzle skirt for testing and evaluation by NASA.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Keystone Synergistic Enterprises, Inc.	Lead Organization	Industry	Port Saint Lucie, Florida
● Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Florida
Mississippi	

Project Transitions

▶ **August 2010:** Project Start

✓ **August 2013:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140863>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Keystone Synergistic Enterprises, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Bryant Walker

Co-Investigator:

Bryant Walker

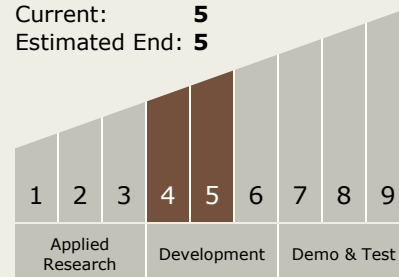
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Technology Maturity (TRL)

Start: **4**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.1 Materials
 - └ TX12.1.2 Computational Materials

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System